

**HYDRAULIC RECEIVER FOR CLUTCH CONTROL,
NOTABLY FOR A MOTOR VEHICLE**

The present invention concerns hydraulic receivers, for clutch control, notably for a motor vehicle, having a fixed part comprising an internal guide tube and a concentric outer body defining a blind annular cavity able to be fed with fluid and inside which there is mounted, so as to be axially movable, a piston carrying a drive element able to act on the declutching device of a clutch.

Such a receiver, also referred to as a receiving hydraulic cylinder, is described in the document EP-B-0 168 932.

The document DE-A-4 313 346 describes and depicts (in Figures 5 to 8) a hydraulic receiver for clutch control provided with a declutching device having a fixed part comprising on the one hand an internal guide tube provided with an axial axis of symmetry and on the other hand a concentric outer body, roughly of annular shape and which has at the centre an outer tubular front end portion surrounding the guide tube. The tube and the guide define between them a blind annular cavity able to be fed with fluid and inside which there is mounted, so as to be axially movable, a piston made of synthetic material which carries, at its front axial end, a drive element able to act on the declutching device of the clutch, of the type in which the internal guide tube projects axially towards the front with respect to the outer tubular portion and serves as a guide for the piston which surrounds the guide tube whilst being surrounded by the tubular portion, and of the type in which the piston carries, at its front end, a metallic carrying and supporting piece which has at least one axially oriented annular portion directed towards the rear in the direction of the outer tubular portion and extended, at its front end, radially outwards by a transverse annular support portion for a

component of the drive element, the outer periphery of this portion coinciding axially with the outer periphery of the piston.

This document proposes no reliable solution for the axial anchoring of the carrying and supporting piece on the front axial end part of the piston.

In order to remedy this drawback, the invention proposes a receiver characterised in that there are provided means of anchoring, by cooperation of shapes, the carrying and supporting piece on the front end of the piston. By virtue of the invention, the piston can be made from mouldable material of the synthetic type or based on aluminium or magnesium, and the anchoring is reliable.

According to other characteristics of the invention:

- the carrying and supporting piece has a first axially oriented annular portion which is offset radially inwards and whose rear axial end is connected to the rear axial end of the second portion by a portion rounded substantially in a semicircle, and the said anchoring means are formed at least partly in the said portion in order to obtain even stronger anchoring;
- the carrying and supporting piece has at least one hole through which a portion of the material of the piston extends;
- holes are formed in the said first axially oriented annular portion;
- holes are formed in the said rounded connecting portion;
- the carrying and supporting piece has holes for its firm anchoring in the piston by the superimposed moulding technique;

- the carrying and supporting piece can be anchored by snapping into the piston;
- the piston has a change in diameter at the outer periphery of its front end with the formation of a transverse shoulder between the changes in diameter, the rounded portion bears on the shoulder and the first portion has inclined lugs each engaged radially towards the inside in a groove formed in the periphery of the reduced-diameter portion of the front end of the piston;
- the piston has a change in diameter at the outer periphery of its front end with the formation of a transverse shoulder between the changes in diameter, the rounded portion bears on the shoulder and the first portion has holes, each of which receives an anchoring toe which extends radially outwards from the periphery of the reduced-diameter portion of the front end of the piston;
- the front axial end of the first annular portion forms a groove for receiving an axially acting self-centring resilient washer which engages at its internal periphery in the groove in the first portion and which bears at its outer periphery on the said one component of the drive element in order to force it in the direction of the transverse annular support portion;
- the first annular portion extends axially towards the front beyond the front axial end of the piston by a length such that this makes it possible to house a sealing scraper joint, at the front of the piston, which has a lip in contact with the outer periphery of the internal guide tube;
- the scraper joint bears on the front face of the piston and is centred by the internal periphery of the first portion;
- the groove which receives the washer is produced by pushing back material leading to the formation of an internal lip for

- axially mobilising the scraper joint between the lip and the front face of the piston;
- the carrying and supporting piece has a third axial annular portion which is offset radially outwards with respect to the second portion so that the outer tubular front end portion can enter radially between the second and third portions;
- the second and third annular portions are connected together by the said transverse annular support portion;
- the third axially oriented annular portion ending in a transverse shoulder extended by an inclined end portion for the centring and support of the front axial end of a preloading spring;
- the front face of the transverse shoulder and of the inclined portion serves as a support for the front end of a sealing bellows;
- the drive element is a ball bearing;
- the ball bearing has an inner race which has at its internal periphery a transversally oriented rim directed towards the axial axis of symmetry of the internal guide tube and which constitutes the said component of the drive element;
- the bellows ends at the front in an attachment rim centred on the inside by the external periphery of the third portion and which bears on a face of the shoulder, the rim enters underneath the internal race of the bearing, axially oriented at this point.

Other advantages will emerge in the light of the description which follows, with regard to the accompanying drawings, in which:

- Figure 1 is a perspective view of the receiver according to the invention;
- Figure 2 is a view in axial section of the receiver of Figure 1;
- Figure 3 is a partial half-view in axial section showing the receiver in the clutch engaged position;
- Figure 4 is a partial half-view to a large scale showing the piston of Figure 2;
- Figure 5 is a view similar to Figure 4 for another example embodiment;
- Figure 6 is a partial view in axial section showing the sealing joint for the piston;
- Figure 7 is a view similar to Figure 6 for another example embodiment;
- Figure 8 is a partial view in axial section of the receiver showing the rear thereof as well as another means of connecting the guide tube to the outer body of the concentric receiver;
- Figure 9 is a view similar to Figure 8 for another example embodiment;
- Figure 10 is a view in section along the line 10 in Figure 9; and
- Figure 11 is a half view in axial section which illustrates a variant embodiment of the supporting and abutment piece with its means of anchoring by snapping onto the piston.

In the figures there are depicted the concentric receiver 1 of a hydraulic clutch control comprising, in a known fashion, a

sender, whose output is connected via a pipe 2 to a feed input 3 of the receiver 1 provided with a variable-volume chamber.

The sender is activated in different ways and has a piston able to move inside a fixed body.

Since it is a case here of an application to a motor vehicle, the sender can be activated by the driver via the clutch pedal, and the receiver acts on the clutch declutching device, usually having a diaphragm.

As a variant, the sender can be activated in an assisted fashion, for example by means of an electric motor, one of the supply terminals of which is connected to a computer controlling the start-up of the motor according to given programs; the output shaft of the said motor forming the input element of a mechanical transmission of elastic assistance means, the said transmission comprising an output element, for example in the form of a pusher acting on the piston of the sender. In all cases the piston defines with the fixed body of the sender a variable-volume chamber. When the sender is activated its piston is moved axially so that the variable-volume chamber is pressurised, as well as the variable-volume chamber of the receiver 1, which increases in volume whilst that of the sender decreases in volume.

When this sender is deactivated the chambers of the sender and receiver are depressurised, the chamber of the receiver decreasing in volume whilst that of the sender increases in volume. There is therefore, during these operations, transfer of control fluid from one chamber to the other. It should be noted that the diaphragm of the clutch - on which only the finger ends have been depicted at 102 in Figure 2 - exerts a return action on the receiver piston when the clutch is re-engaged; the chamber of the receiver resuming its initial volume.

The control fluid can be gaseous in nature. It can for example be compressed air. Here the control fluid is hydraulic in nature and consists of oil.

For reasons of simplicity the control will be referred to as hydraulic control, whatever the nature of the fluid.

As is known, the control chamber of the receiver 1 is delimited by a fixed part 4 and 5 and by a movable part 6 in cylinder-piston relationship.

The fixed part 4, 5 delimits a blind cavity 7, annular in shape, into which the feed inlet 3 opens out.

The movable part is an annular-shaped piston 6 able to move axially inside a cavity 7 in order to define with the latter the aforementioned variable-volume chamber.

The cavity 7, and the said chamber, is therefore able to be pressurised and depressurised from the inlet 3 via the pipe 2.

Here the fixed part 4, 5 and the movable part 6 - the piston 6 - are coaxial whilst being arranged concentrically. The receiver 1 is therefore of the concentric type; the cavity 7 being blind, axially oriented and annular.

More precisely the fixed part 4, 5 is here in two concentric pieces 4, 5.

One of the pieces, referred to as the outer piece 4, roughly annular in shape, hereinafter referred to as the outer body 4, has at the centre a tubular front end portion 8 surrounding the other piece 5 in the form of a guide tube 5. This internal tube 5 is metallic. It is of small thickness in order to reduce the radial bulk and has an axial axis of symmetry X-X'.

The thickness of the tube 5 is less than the thickness of the tubular portion 8, with an axial length less than that of the tube 5.

The tube 5 projects axially with respect to the tubular portion 8 and serves as a guide for the piston 6, which thus surrounds the tube 5 whilst being surrounded by the tubular portion 8.

The piston 6 carries at its rear end a dynamic joint 8 with lips. This joint enters inside the cavity 7 and makes the latter fluidtight. The front end of the piston 6 acts on a clutch release bearing 9, which consists here of a ball bearing having a rotating race, forming a drive element, able to act on the clutch diaphragm, and a non-rotating race in relationship with the piston 6. This piston 6 acts through its front end on the non-rotating race, separated from the rotating race by balls.

Here the races of the bearing 9 are concentric and coaxial. This release bearing is carried by the piston 6 sliding axially along the metallic tube 5.

The bearing 9 can be fixed radially whilst for example being force-fitted by its non-rotating race on the piston 6.

Here the bearing can move radially with respect to the piston 6 and with respect to the clutch diaphragm in order to reduce wear, giving that the axial axis of symmetry of the diaphragm is not the same as that of the receiver 1.

The centring of the bearing 9 with respect to the diaphragm will not necessarily be maintained. For example, an element made of resilient material, such as elastomer, can be interposed radially between the piston 6 and the non-rotating race of the bearing 9. This element also couples the bearing to the piston.

Here a radial clearance exists between the front end of the piston 6 and the bearing 9, and an axially acting resilient washer 10 couples the bearing to the piston 6 as described below. The bearing 9 can move radially with respect to the piston until it finds its centring position with respect to the diaphragm. This centring is subsequently maintained by the resilient washer 10. The clutch release bearing 9 is thus of the maintained self-centring type.

The rotating race, here the outer race, is profiled for local contact with the diaphragm, or more precisely for local contact with the inner end of the fingers 102 thereof.

Thus, when the inner end of the fingers of the diaphragm, centrally open, is of curved shape, the front face of the rotating race, intended to cooperate with the said end, is roughly flat in shape.

When the inner end fingers of the diaphragm is flat, the external face of the rotating race is then curved, as can be seen in Figure 2.

Here the release bearing 9 is able to act in thrust on the inner end of the fingers of the diaphragm, the peripheral part of which, in the form of a Belleville washer, acts on the pressure plate of the clutch, either directly or indirectly by means of a Belleville washer mounted in series with a diaphragm, in order normally to force the said plate in the direction of the engine flywheel of the vehicle, forming a reaction plate, in order to clamp the friction linings of the clutch friction device between the said reaction and pressure plates secured with respect to rotation to the crankshaft of the vehicle engine.

This friction device, also referred to as a friction disc, has at its centre a hub coupled rigidly or resiliently to a disc carrying the friction linings. The hub is internally fluted

for its connection with respect to rotation to a drive shaft, here the input shaft 100 of the gearbox, depicted partially in Figure 2. This shaft 100 passes through the guide tube 5 whilst being surrounded by it. The clutch is therefore normally engaged (Figure 3), the volume of the variable chamber of the receiver 1 then being at a minimum with a residual pressure in the cavity 7. A return spring 11, referred to as a preloading spring, is interposed axially between the portion 8 and the ball bearing 9 in order to keep, in a known fashion, the rotating race of the bearing 9 in permanent contact with the diaphragm in order to reduce wear. The torque of the drive shaft is therefore transmitted to the input shaft of the gearbox.

In order to disengage the clutch (Figure 2), the cavity 7 of the receiver is pressurised in the aforementioned manner, which causes an increase in volume in the chamber thereof and a movement of the piston 6 and release bearing 9 towards the right in Figure 2.

The diaphragm, pivotally mounted on a cover fixed to the engine flywheel, tilts until its action of the pressure plate is cancelled out. The clutch is then disengaged since the friction linings of the clutch friction device are then released.

The engine torque is then no longer transmitted to the input shaft of the gearbox having a casing.

Naturally the clutch can be equipped with a device for compensating for the wear on the friction linings.

When the cavity 7 is depressurised, the diaphragm moves the clutch release bearing and the piston towards the left in Figure 2. The volume of the receiving chamber 1 is then at a minimum and the piston 6 resumes its initial position (Figure 3).

The fixed part 4, 5 is intended to be fixed here to the front wall of the fixed casing of the gearbox. The wall has the gearbox input shaft 100, depicted partially in dotted lines in Figure 2, passing through it, with the intervention of a joint 101, referred to as a rotating joint, in contact with the input shaft. This wall therefore has an opening for the input shaft to pass through.

Here it is the external piece 4 of the fixed part 4, 5 which is fixed to the gearbox casing, at the said opening.

More precisely, this piece 4 forms an outer body of roughly annular shape surrounding the internal guide tube 5. The body 4 has two lugs 130, only one of which is visible in Figure 1, for fixing it to the wall of the gearbox casing, usually by means of screws each passing through an opening 131 in each lug. A third fixing point is also provided, the passage hole of which can be seen at 131.

The rear of the body 4 is roughly in the form of a plate 120, from which the tubular front portion 8 originated by casting. The body 4, made of castable material, is for example based on aluminium.

The lugs 130 form part of the plate 120 and extend mostly radially outwards.

Having regard to the strength of the body 4, this is profited from in order to extend it, to the rear of the wall 8 of the plate 120, by means of a transverse flange 15, directed radially inwards, constituting the bottom of the blind cavity 7. This flange 15, referred to as the internal flange, belongs to a rear tubular portion 121 extending to the rear of the plate 120. The flange 15, directed radially towards the axis X-X', is thicker than the tube 5.

The flange 15 makes it possible to limit the deformation of the cavity 7 under the effect of the pressure variations to which it is subject during operations of declutching and re-engagement of the clutch. The movement of the piston 6 is thus more precise and more faithful.

In addition the tube 5 and more precisely the means 16 of connecting this to the body 4 are preserved, as well as the static sealing joint 17 of the cavity 7. This joint 17 is hermetic in shape whilst being axially oblong in shape for good contact with the tube 5 and a good seal.

Here the connecting means 16 consist of a fixing by crimping.

More precisely, the rear portion 121 is notched in order to house the gasket 101 and to delimit the flange 15. A connecting groove 32 is produced at the rear of the flange 15 and the metal of the tube 5 is made to flow inside the groove 32, here semicircular in section, favourable to good fixing. The thickness of the tube 5 makes this possible. It will be noted that the gasket 101 bears on the face of the flange 15 turned in the opposite direction to the cavity 7. By virtue of this method of connection, in combination with the flange 15, the tube is simple in shape and does not have at the rear a transverse collar for fixing it by crimping to the body 4.

The tube 5 undergoes very small deformations under the effect of the pressure variations in the cavity 7. The piston 6 moves under good conditions.

These crimping means 16 are offset axially towards the front with respect to the sealing joint 17 acting between the internal periphery of the flange 15, directed radially inwards, and the external periphery of the guide tube 5. Here the joint 17 is carried by the internal flange 15, whilst being mounted in a splayed sealing groove, not referenced, which the said flange has at its internal periphery. The sealing groove is

splayed radially inwards in the direction of the axis X-X' and axially is broader than the connecting groove 32. This flange 15 is of small height and belongs to the rear part of the body 4, whose plate 120 is pierced in order to form the feed inlet 3 opening out into the bottom of the cavity 7. The pipe 2 is attached by screwing its seating to the top edge of the plate 120, in line with the inlet 3. The crimping means 16 - local flowing of the tube 5 into the groove 32 - are located axially between the joints 17 and 101.

The preloading spring 11 surrounds the tubular portion 8 whilst being centred by it. A shoulder 105 is formed at the junction of the tubular portion 8 with the plate 120 suitable for having the shaft 100 pass through it.

It will be noted that the body 4 does not have any drainage channel, this being produced at the outer periphery of the pipe 2 at 119.

More precisely the pipe 2 extends outside the casing of the gearbox and passes through the said casing. This pipe has, outside the said casing, a tubular protuberance 119 serving to effect the drainage. This protuberance is normally covered by a protective cap 118. The pipe has an external end 117 shaped as a female connector which can be broached with a pin 116 engaged in slots in the end 117 in order to receive the male connector of a conduit coming from the sender.

The pipe 2 has the shape of a right angle with a vertical part fixed to the plate 120 and a roughly horizontal part extending outside the casing of the gearbox and carrying the drain 119 and the end coupling. Here, the pipe 2 has a seating with laterally two holes for the passage of screws enabling the seating to be fixed to the outer edge of the plate 120 (Figure 1). Naturally the pipe 2 can be attached by broaching or screwing to the body 4. The shoulder 105 serves as a support for an end rim on a protective bellows 21 surrounding the

spring 11, in the form of a coil spring. The spring 11 bears at one of its ends on the said rim by means of a metallic support piece 123 interposed between the spring and the rim. The piece 123 has two transverse parts connected to each other by a roughly horizontal part. One of the transverse parts is in contact with the end rim radially above the other transverse part in contact with the spring 11 centred by a thicker part, on the rear end of the front tubular portion 8.

The other end of the bellows 21 is attached to a metallic abutment and support piece 122, referred to as a carrier piece 122, roughly annular in shape.

The carrier piece 122 is here made of sheet metal and carries the resilient washer 10, usually referred to as a self-centring washer, the bearing 9 and the front end rim of the bellows 21.

In Figures 1 to 4 the piece 122 is embedded (anchored) partly in the piston 6 made of synthetic material, here made of plastics material reinforced with fibres. The piston 6 can for example be based on "Delrin" or can be made from other material having good slip qualities. Thus, according to the invention, by virtue of the holes 124, strong and reliable means are provided for anchoring the piece 122 on the front end of the piston 6, by cooperation of shapes.

At the front of the piston 6, a scraper joint 150 is provided, described below, in order, in a known fashion, to avoid contaminating the friction linings of the friction disk.

The piece 122 has, to do this, as can be seen better in Figure 4, holes 124 for its firm anchoring in the piston 6 by the superimposed moulding technique. The piece 122 is therefore fixed by superimposed moulding onto the piston 6 made of synthetic material. As a variant, the piston 6 is made of castable material based on aluminium or magnesium.

More precisely, the carrier piece 122 has, at its internal periphery, a first axially oriented annular portion 125, pressed at its front free end in order to form a groove 126 for receiving the washer 10. The other end of the portion 125 is connected to a portion rounded in a semicircle 127, extended by a second axially oriented annular portion 128 parallel to the first portion 125.

The second portion 128 is extended radially outwards, at its rear end, by a transverse supporting annular portion 129, itself extended by an inclined clearance portion 133, extended by a third axially oriented annular portion 134 terminating in a transverse shoulder 135 extended by an inclined end portion 136. On the portion 136 there is formed a stud for cooperating with the last turn of the spring 11 and to lock the latter with respect to rotation.

The annular piece 122 thus has a sinuous shape and three axially oriented annular portions 125, 128, 134 offset radially with respect to each other, the third portion 134 being longer axially than the first portion 125, itself longer axially than the second portion 128.

The third portion 134 is directed axially towards the rear in the opposite direction compared with the first portion 125. The transverse portion 129 serves as a support for the inner race of the bearing 9, here made from sheet metal. The outer rotating race of the bearing 9 is here made of sheet metal, but as a variant may be solid. More precisely, the inner race of the bearing has, at its internal periphery, a transversally oriented flange 91 directed towards the axial axis of symmetry X-X' of the guide tube 5. The bearing 9 has, in cross section, roughly the shape of a flag extending from the flange 91, axially in the direction of the outer body 4 like the portions 128, 134, whilst the first portion 125 extends on each side of the portion 129 and is directed axially in the opposite direction to the body 4. The inner race of the bearing 9

extends roughly radially above the inclined portion 133 and the third portion 134. As will have been understood, the inclined portion 11 reduces the radial size and prevents any interference between the inner race of the bearing 9 and the third portion 134.

Naturally the bearing 9 is fluidtight and has axially, on each side of its balls, sealing means.

The resilient self-centring washer 10, here inclined with a cross section in the shape of a dihedron, engages at its internal periphery in the groove 126 in the first portion 125 and bears at its external periphery on the flange 91 so that the said flange 91 is gripped elastically between the washer 10 and the support portion 129. A radial clearance exists between the internal periphery of the flange 91 and the first portion 125, knowing that the washer 10 forces the flange 91 axially towards the rear in the direction of the support portion 129. According to one characteristic, the portion 129 is offset axially towards the rear with respect to the groove 126 and the piece 122 is anchored in the piston to the rear of the portion 129 for a firm anchoring of a good support for the inner race.

The holes 124 are produced in the first portion 125 and in the rounded portion 127. The portion 127 is embedded in the piston 6 and the same applies partly to the first portion 125. The second portion 128 is embedded in the piston to a major extent, to the exception of its external periphery.

More precisely, the external periphery of the second portion 128 coincides axially with the external periphery of the piston 6 in direct contact with the external periphery of the guide tube 5. Thus the carrier piece 122 is well anchored in the piston 6.

The length of the first portion 125 depends on the application. Here this first portion 125 projects axially with respect to

the front end of the piston 6, with a length such that this makes it possible to house the sealing scraper joint 150 at the front of the piston. The joint 150 has a lip in contact with the external periphery of the guide tube 5. This joint bears on the front face of the piston 6 and is in close contact, that is to say centred, through the internal periphery of the first portion 125. The groove 126 is produced by pushing back material leading to the formation of an internal rim 151 and for axially immobilising the joint 150 between the said rim and the front face of the piston 6. Here the front end of the joint 150 is hollowed out in order to match the shape of the rim 151. As will have been understood, the joint 150 is mounted by force fitting and snapping in. The front end of the joint 160 is intended to bear on a circlip 152 engaged in a groove 153 produced by pushing back material on the tube 5. Naturally this contact takes place when the receiver 1 is not yet mounted on the vehicle. This prevents the piston 6 from escaping, under the action of the spring 11, from the body 4.

The guide tube 5 therefore has a simple shape with two places where material is pushed back, directed radially in opposite directions, the first directed towards the axis X-X' in order to form the groove 153, the other directed radially in the direction opposite to the axis X-X' in order to form connection means 16 and a pushing back of material entering the connecting groove 32. Naturally, the sealing lip of the joint 150 is recessed axially with respect to the front end of the joint 150 in order not to come into contact with the latter.

As will have been understood, the radial distance between the second portion 128 and the third portion 134 depends on the thickness of the front portion 8 of the body 4, so that the said portion can enter radially between the portions 128, 134, as can be seen in Figure 3. The axial dimension of the release bearing is thus reduced when the clutch is engaged (Figure 3).

Here a radial clearance exists between the inclined clearance portion 133 and the portion 8 when the clutch is in the engaged position (Figure 3). The shoulder 135 and the end portion 136 have a dual function. The dorsal face of the portions 135, 136 serves as a support for the spring 11, whilst the front face of the portions 135, 136 serves as a support for the front end of the bellows.

The portion 136 avoids damaging the bellows 21 terminating at the front in an attachment rim 160 centred internally by the external periphery of the third portion 134. The rim 160 bears on the front face of the shoulder 135. The rim 160 enters below the inner race of the bearing, axially oriented at this point. The portion 136 enables the spring 11 to be centred and prevents rotation thereof.

Thus, in accordance with the invention, the carrier piece 122 is a multifunction piece reducing the cost of the tubular-shaped piston 6. This piece 122 carries the washer 10, the joint 150, the bearing 9 and the front ends respectively of the bellows 21 and spring 11. The piece 122 serves as a friction face for the flange 91 and reduces the axial and radial bulk of the receiver.

The piston 6 can thus be standardised and has an annular groove 92 at its external periphery in the vicinity of its rear end. The groove 92 has a bottom delimited by two transverse sides. The dynamic joint 80 is carried by a piece 93 provided with stepped axial holes 94. The rear face of the piece 93 is hollowed out at the centre and is thus delimited by an axial collar 95. The holes 94 open out centrally in the rear face.

Thus the joint 80 is injected through the holes 94, so that the joint 80 is centred by the collar 95 and has shouldered pins 180 engaged in the holes 94, the said pins each being immobilised axially by the collar 96 formed by means of the

change in diameter of the hole 94 stepped in diameter in order to do this.

The joint 80 is thus secured to the piece 93, here made of synthetic material such as plastics material, and is centred by the said piece 93 entering the sealed cavity 7. The front end of the piece 93 has at least one catch 97 engaged with axial clearance in the groove 92.

The catch 97, directed radially towards the axis X-X', can be continuous or divided, belonging in this case to lugs which are elastically deformable radially in the opposite direction to the axis X-X'. The piece 93, and therefore the joint 80, is mounted on the piston 6 by snapping on.

At the rear of the catch or catches 97, the piece 93 has a tubular portion 98, extended by a portion with a spherical internal face 99. The piston 6 at its external periphery has, at its rear end, a cylindrical face 68 extended by a curved face 69. The piston 6 is thus toric at the rear, or more precisely the curved face 69 has a radius very much less than that of the spherical internal face 99 of the piece 93 carrying the joint 80.

The radius of the sphere of the face 99 has a centre situated on the axis X-X'. A radial clearance exists between the cylindrical face 68 and the internal periphery of the portion 98, which enables the piston to swivel by contact of its face 69 with the face 99.

At its internal periphery the piston 6 has an axial projection 65 with an inclined external face of frustoconical shape in contact with an inclined internal face 90 of frustoconical shape, which has the piece at its internal periphery.

Thus, because the ends of the fingers 102 of the diaphragm are not in the same plane, by contact with the release bearing 9,

there will occur, in the position in Figure 3 - clutch engaged - a wobbling movement of the piston, which will not result in a movement of the piece 93 and joint 80, an axial clearance existing between the catches 97 and the sides of the groove 92. This clearance allows a movement of the piston vis-à-vis the piece 93, which reduces wear on the joint 80. More precisely, the movements of the piston 6 under the conditions of Figure 3 are minute and the piece 93 remains in place under the effect of the residual pressure then prevailing in the cavity 7. The piston 6 can then pivot (swivel) through contact of its face 69 with the face 99 of the piece 93. When the cavity 7 is pressurised (Figure 2), contact is obtained between the faces 65 and 90 and therefore a good movement of the piston 6 without any risk of jamming.

Naturally, Figure 5, the portions 128 and 125 of the piece 122 can be in contact with each other. The carrier piece 122 can be anchored by snapping in the piston 6 then having a change of diameter at the external periphery of its front end with the formation of a transverse shoulder 61 between the changes in diameter.

In this case the rounded portion 227 bears on the shoulder 61 and the first portion 125 has inclined lugs 224 each engaged in a groove 62 in the front end of the piston 6. As in Figure 1, the carrier piece is anchored on the front end of the piston 6 at the rear of the support portion of the carrier piece 122 by cooperation of shapes.

As a variant the means 16 of connecting the tube 5 to the body 4 can have another shape. Thus, in Figure 8, the joint 17 is mounted in the bottom of a connection and sealing groove 132 with a trapezoidal shape. The local pushing back of material 116 of the tube 5 is effected directly in this groove 132.

The joint 17 is compressed between the pushed-back material 116, directed in the opposite direction to the axis X-X' and

the bottom of the groove 132. In this case the machinings of the flange 15 are reduced.

As a variant, Figures 9 and 10, the joint 17 is, like Figure 4, placed in a special connecting groove 332 less wide axially than the sealing groove. The connection is produced by means of a circlip 226 corrugated radially and open mounted in a radial connecting groove 332 of oblong shape provided in the flange 15 and in a groove 333 provided in correspondence in the rear end of the tube 5. This groove 333 results in locally pushing back the tube 5 towards the inside in a similar manner in order to form the groove 153. Thus the connection of the tube 5 to the body 5 is effected by snapping in, the circlip being placed in advance in the groove 332. This circlip 226 is elastically deformable radially inwards in order to close up and then slacken and fall into the groove 33 when the tube 5 is connected with the body 4.

The internal tube 5 therefore has a symmetrical shape. Naturally, the joint 80 has an external lip, for contact with the internal periphery of the portion 8 of the body 4, and an internal lip for contact with the external periphery of the tube 5. This joint can be connected to the piston by a piece made of folded sheet metal 193, as can be seen in Figure 7.

In this case, the folded sheet metal 193 has, at its front end, a radial flange 194 entering the groove 92 in the piston 6 and has at its rear end a radial flange 195 parallel to the flange 194. Each of the flanges 194, 195, directed radially inwards and therefore towards the axis X-X', is connected to an axially oriented annular portion respectively 197, 198. Each portion 197, 198 is connected to a double central portion 196, formed by two contiguous portions, connected respectively to the portion 197 and to the portion 198.

The central portion 196 has on the inside a spherical internal face 199 with a radius centred on the axis X-X' and able to cooperate with a curved external face 169 of the piston.

The face 169 has a radius less than that of the sphere, as in Figure 6.

The face 169 is connected to a groove 161, formed at the rear of the piston 6. The dynamic lipped joint 80 has shouldered pins 180 which have a groove in which the flange 195 and the rear end collar 162 of the piston delimiting the groove 161 engage.

The head of the pin 180 enters the groove 161 and the space provided between the flange 195 and the central portion 196.

Naturally, the external body can be mounted indirectly on the fixed structure, via the gearbox casing, by means of an adaptation sole plate, as described, for example, in the document FR-A-2 745 616.

In this case, the outer body is standard and it is the sole plate which carries the fixing lugs for the connecting means of the bayonet type, acting between the sole plate and the outer body. The clutch release bearing can have, by reversing the structures, a rotating inner race and a non-rotating outer race, provided with an internal flange, intended to bear, under the action of the elastic self-centring washer, against the transverse support portion 129 of the carrier piece 122.

As is clear from the description of the drawings, the internal flange 15, advantageously obtained by casting, is thicker than the guide tube 5. The connecting means 16 can be crimping or snapping-in means and make it possible to fix the guide tube 5 to the internal flange 15. The connecting grooves 32, 132, 332 of the internal flange open out at the internal periphery of the flange 15.

The outer body 4 can be made from mouldable synthetic material, such as plastics material reinforced by fibres.

The circlip 152 forms a stop for the piston 6. This stop can have another shape. The portion 133 can be eliminated and the third portion 134 can be connected directly to the portion 129.

It should be noted that the control fluid, here oil, enters the cavity 5 under very good conditions. This is because the inlet 3, in the form of a duct, opens out at the top part of the front face of the internal flange 15. This top part forms a clearance (a notch) of rounded shape extended by an inclined face.

The internal bore of the portion 8 is also notched at its rear part at the inlet 3. This makes it possible to effect a lapping and prevents the top lip of the joint 80 coming into contact with the flange 15. The clearance in the front face of the flange 115, delimiting the cavity 7, therefore also affects the rear end of the internal periphery of the front portion 8.

In all cases, the flange 15 has a groove at its internal periphery for connecting the guide tube.

A description will now be given of the variant embodiment illustrated in Figure 11, which has different means for the axial snapping of the piece 122 onto the reduced-diameter front portion of the piston 6.

As in Figure 5, the piston 6 has a change in diameter at the external periphery of its front end with the formation of a transverse shoulder 61 between the changes in diameter. The rounded connecting portion 327 between the portions 128 and 125 bears axially towards the rear on the shoulder 61. The first portion 125 has holes 324, each of which is produced by means of a slash, radially towards the outside, in the first portion

125. Each hole receives an anchoring toe 300 which extends radially towards the outside from the periphery 302 of the reduced-diameter portion 304 of the front of the piston 6.

In order to facilitate this snapping in, each anchoring toe 300 has an inclined front face 306 forming a snapping-in bevel.